Design-Build of the Block 25A Academic Building

University of California, San Francisco, Mission Bay Campus
San Francisco, CA

April 14, 2015

BFCC Engineering Project No. 1

Prepared for:

Amec Foster Wheeler
WRNS Studio Design Team
San Francisco, CA

Prepared by:

BFCC Engineering
Provo, UT

April 14, 2015

Amec Foster Wheeler
WRNS Studio Design Team
San Francisco, CA

Attn: Mr. Alex D. Wright
E: alexander.wright@amec.com
P: (801) 589-1177

Re: Geotechnical Engineering 50% Report
Design-Build of the Block 25A Academic Building
San Francisco, CA
BFCC Engineering Project No. 1

Dear Mr. Wright:

BFCC Engineering has completed the final report for the Design-Build of the Block 25A Academic Building for the University of California, San Francisco, Mission Bay Campus. This study was performed in general accordance with our proposal submitted December 1st, 2014. This report presents our findings including; site and soil analysis, retaining wall design recommendations, seismic hazards analysis, and foundation design and recommendations.

We've appreciated the opportunity to be of service to you on this project and we thank you for choosing BFCC Engineering. If you have any questions or suggestions concerning this report, please contact us.

Sincerely,

BFCC Engineering

Craig Fowler
Project Manager

Tyler Cecil
Safety Expert

Stott Bushnell
Geotechnical Expert

Cathryn Cecil
Technical Expert

Table of Contents

1.0 INTRODUCTION

In response to your request, BFFC Engineering (BFFC) has prepared this report to provide geotechnical evaluations and recommendations to Amec Foster Wheeler for use by the WRNS Studios (WRNS) team for the design build of the Block 25A Academic Building (Block 25A) at the University of California, San Francisco (UCSF), Mission Bay Campus located in San Francisco, California. The recommendations presented herein are intended for use by the Building 25A Design Build team to assist the team in the development of the final designs for, and construction of, the buildings, site civil improvements, and other associated utility work.

1.1 Project Description

We understand that Block 25A will be a six story office building with a partial seventh story with a footprint of 44,000 square feet, located on the corner of 16th Street and 4th Street in San Francisco (Figure 1). The building will be a faculty office building located in a developed research campus bordered on two sides by city streets and on the other sides by existing parking lots. The main goal of the project will be to provide geotechnical evaluations and recommendations to be used for the design of the building. This will involve characterizing the site based on geology, existing soil, and seismic hazard. This report will then give the recommendations for retaining wall and foundation design.

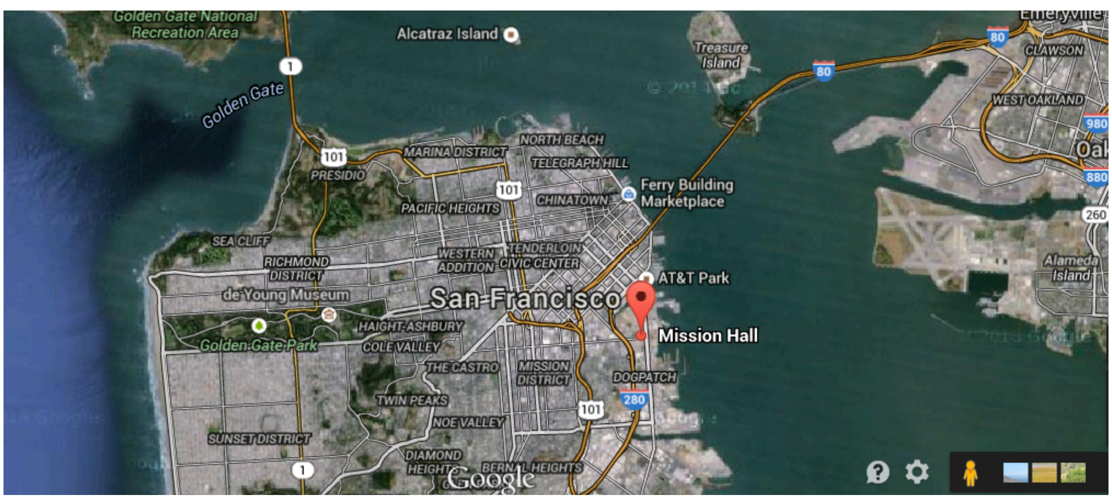

Figure 1: Location of site in reference to the Bay Area

1.2 Scope of Work

The work conducted for this report includes:

- Review of existing data
- Summary of site terrain and local geology
- Description of subsurface soil and groundwater
- Discussion of seismic setting and seismic hazards
- Assessment of potential earthquake-related geologic geotechnical hazards and discussion of possible mitigation measures
- Recommendations for earthwork construction
- Recommendations for design of retaining walls
- Presentation of foundation options and recommendations regarding foundation elements

We were not given any information on environmental evaluations.

2.0 FIELD EXPLORATION

Field observations and explorations were completed on the site. Cone penetration testing (CPT) was performed on site by Berkel. There were approximately 8 CPT tests at various locations, mostly at the corners of the building footprint. There were 3 locations were Kleinfelder's boring logs were completed. The first was located along the north side of the future building (Figure 2), it went approximately 60.1 feet deep. The second boring log located in the Northeast corner of the future building was approximately 65.5 feet deep and third was taken on the southeast side of the building and went 45.3 feet deep. The location and number of boring logs for this site were found using the appropriate ASTM regulations.

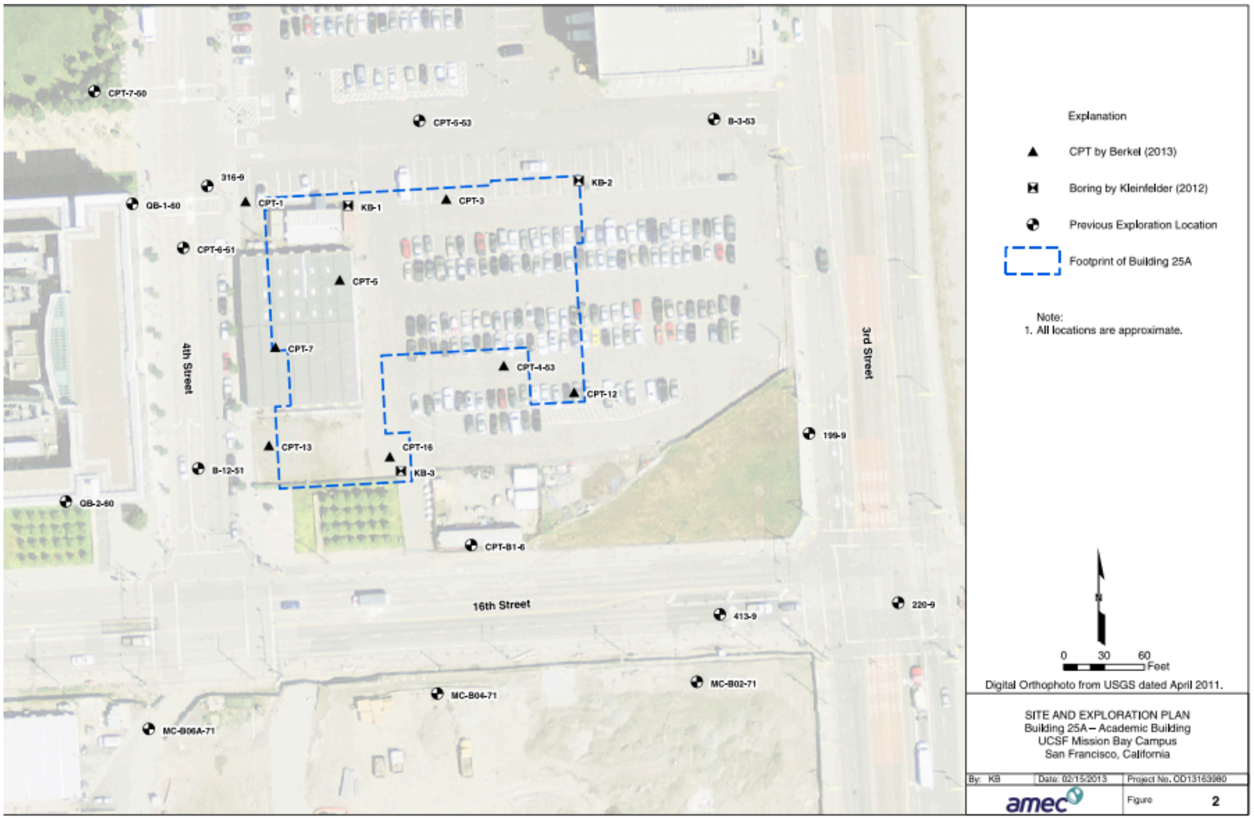

Figure 2: Locations of boring and CPT exploration

3.0 LABORATORY TESTING

The field exploration data was taken to the laboratory for appropriate testing. The follow tests include previous and existing geotechnical exploration data test results given for this site:

- Standard Penetration Test (SPT)
- Cone Penetration Test (CPT)
- Dry Density
- Moisture Content
- Atterberg Limits
- Grain size distributions
- Triaxial unconsolidated-undrained tests
- Consolidation
- Site Maps
- Preliminary Conceptual Designs
- Geologic Maps

The laboratory testing was done in compliance with ASTM standards. The raw data of the laboratory testing can be found in Appendix A.

4.0 GENERAL SITE CONDITIONS

4.1 Surface Conditions

The surface conditions of this site don't have any immediate concerns. There is currently an asphalt concrete lot over the site. This information was taken from boring log data. The site is relatively level from previous construction projects on the site.

4.2 Subsurface Conditions

Along with the field and laboratory testing results, Figure 3 was provided to assist in characterizing the subsurface conditions of the site. As shown in the figure, our site misses a lot of extreme soil conditions but there are some areas nearby that have concerns.

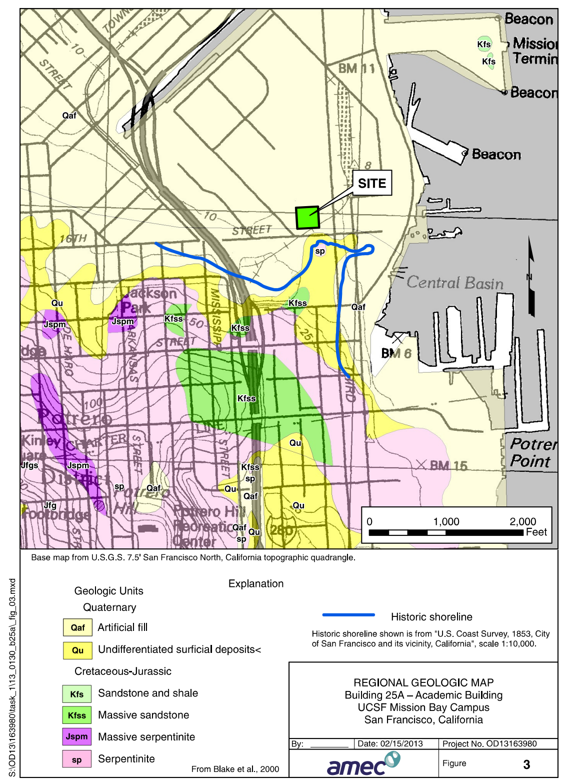

Figure 3: Regional geological map

A soil profile was needed for the seismic analysis and retaining wall and foundation design. There were 3 different sites where boring log data was completed. The sites were named Northeast Parking Lot, Northwest Parking Lot and Southeast Parking Lot. The most important data needed from these boring logs was the water table elevation, soil types and their corresponding depths. The data is organized in two different ways. One by depth and the other by boring log sample number. The boring log sample numbers table includes the depth of the sample, blow counts, description of soil, plasticity, plasticity index, liquid limit, percentage of water content and the dry unit weight of the sample. The data organized by depth includes everything that is recorded by sample number but corresponds to the depth rather than the boring log sample number. A soil profile was then created with depth to give us the soil types starting at the ground surface all the way down to the end of the borings. The soil profiles and corresponding soil types will be used in the retaining wall design, seismic analysis and foundation design by finding the best design that works with the soil conditions on the site. The soil profiles can be found in Appendix B.

4.3 Groundwater

For each boring log the depth of groundwater was recorded. The results of those recordings can be found in Table 1. The depth of groundwater is important when looking at liquefaction concerns and other foundation design elements. Concerns with these depths to groundwater are discussed in the earthwork section. The southeast parking lot boring logs give a record of the depth of the groundwater table.

Table 1: Depth of Groundwater as Recorded at Each Boring Log Site

Boring Location	Depth to Groundwater (ft)
Northeast Parking Lot	12.7
Northwest Parking Lot	11
Southeast Parking Lot	NR

5.0 SEISMICITY AND GEOLOGIC HAZARDS

5.1 General

For seismic considerations, a discussion of seismic setting and seismic hazards (including risks from tsunamis/seiche/flooding) was needed to assess future probabilities of hazards. According to multiple studies by government agencies in California(Association of Bay Area Governments, 2015) (California Emergency Management Agency, 2015), there is little to no risk of flooding due to tsunamis or seiche as seen in Figure 4. Although the site is relatively close to the bay, it is high enough and far enough away to stay out of flood zones. Also, the location on the inside of the bay protects the region from tsunamis from the Pacific Ocean.

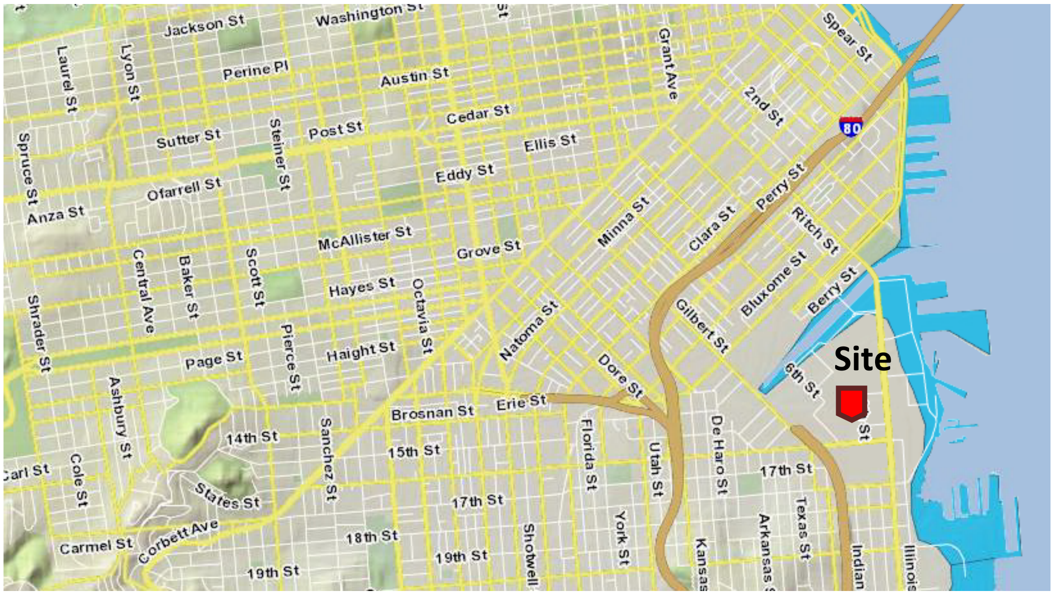

Figure 4: Flood hazard zones for San Francisco, California

Although there is no flood hazard, these same studies show that the site is in a high ground shaking area and is prone to liquefaction. San Francisco is located near many major faults including Hayward-Rogers and San Andreas. These faults have given the San Francisco area a rich and long history of major earthquakes causing major damage to the city. The Association of Bay Area Governments prepared a liquefaction hazard zone map as seen in Figure 5, and the Block 25A building site lays in the red danger zone for liquefaction.

Figure 5: Liquefaction hazard zones for San Francisco, California

5.2 Liquefaction

Since the site lies within potential liquefaction zones, further research is needed to understand the liquefaction risks. The first step was to understand the faults in the area and to calculate their median and 84 percentile magnitudes. This was done using four methods (Wells and Coppersmith, Sterling, Hanks, and Ells), and then the values were averages to obtain the magnitudes for each fault in reference to the distance from the site.

Table 2: Faults Distances and Magnitudes

Fault Name	Closest Distance to Site (km)	Median Moment Magnitude	84% Moment Magnitude
N. San Andreas	12.42	8.01	8.41
Hayward-Rodgers Creek	16.6	7.41	7.81
SanGregorio	18.75	7.52	7.93

Next, liquefaction reports were prepared using the program CLiq, the fault information, and the data previously obtained. A report was prepared for each bore hole for both the 475 return year and 2475 return year earthquake. Most sites showed about medium potential for liquefaction, but bore hole 12 showed great potential for liquefaction as seen in Figure 6.

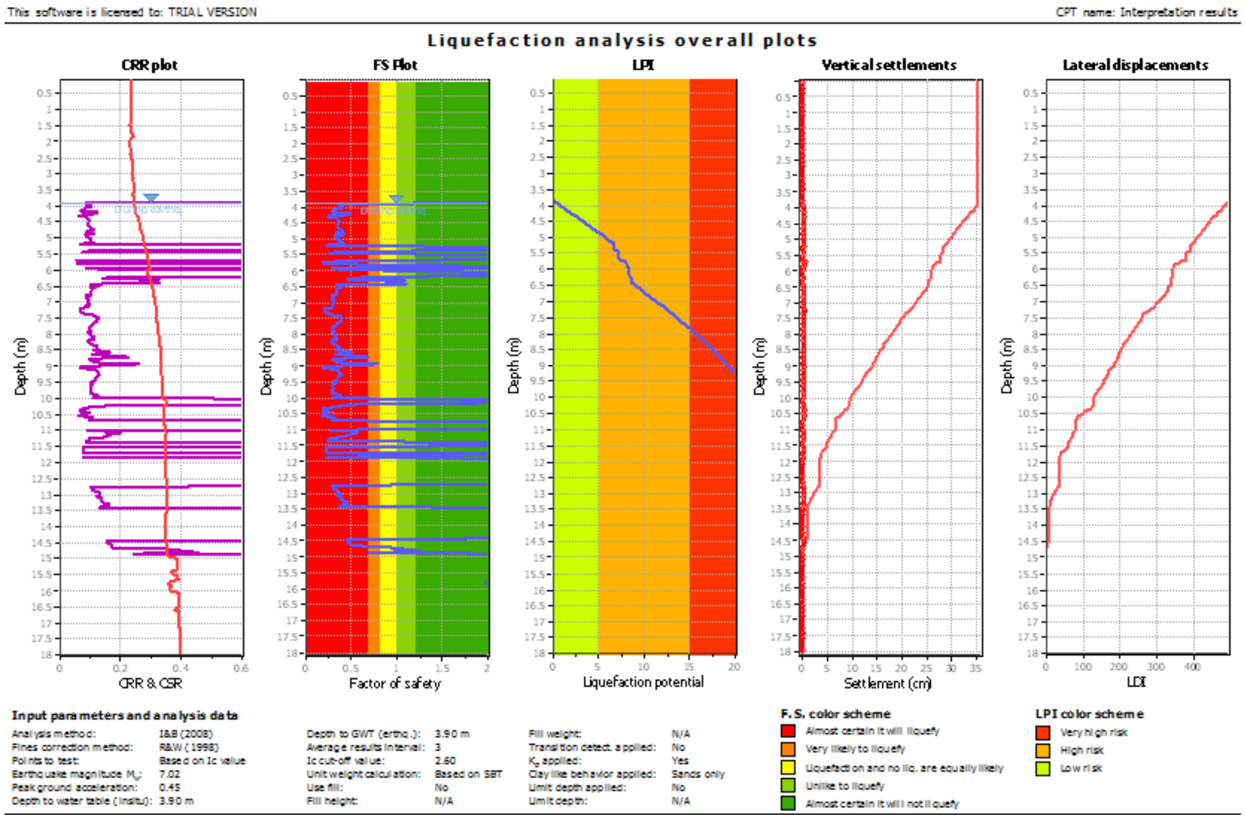

Figure 6: Liquefaction hazard report for Bore Hole 12 during 475 return year earthquake

Lastly, lateral spread displacements were calculated for the site using the soil and fault parameters. The median lateral displacement for an earthquake on San Andreas Fault would be about 3.08 meters, and as high as 4.85 meters of spread. These are large displacements with high potentials of occurring that can affect the building. Steps should be taken to help mitigate these potential issues.

There are a few options to help mitigate liquefaction problems. The first option is soil improvements for the site. These improvements include draining the water from the soil and compacting the soil. A vibrating probe can be used to further densify the soil. The other option is to design the foundation elements to resist the effects of liquefaction.

5.3 Seismic Design Parameters

Using USGS tools (U.S. Geological Survey, 2015), a design response spectrum was developed for the site as seen below. The site soil classification used for calculating ground motion hazards was Site Class D because the shear wave velocity of the site was about 650 feet/sec (200 m/s). The risk category for a higher education building with more than 500 residents falls under risk category III. The design response spectrum created from the results allows structural engineers to calculate the acceleration of the building based off of the building's period. They can also use the other seismic parameters from the report to do other calculations to assist in the seismic design of the building.

Building Code Reference Document	2012 International Building Code (which utilizes USGS hazard data available in 2008)
Site Coordinates	37.767°N, 122.39°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

USGS–Provided Output

S_S = 1.500 g	S_{MS} = 1.500 g	S_{DS} = 1.000 g
S_1 = 0.600 g	S_{M1} = 0.901 g	S_{D1} = 0.600 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.

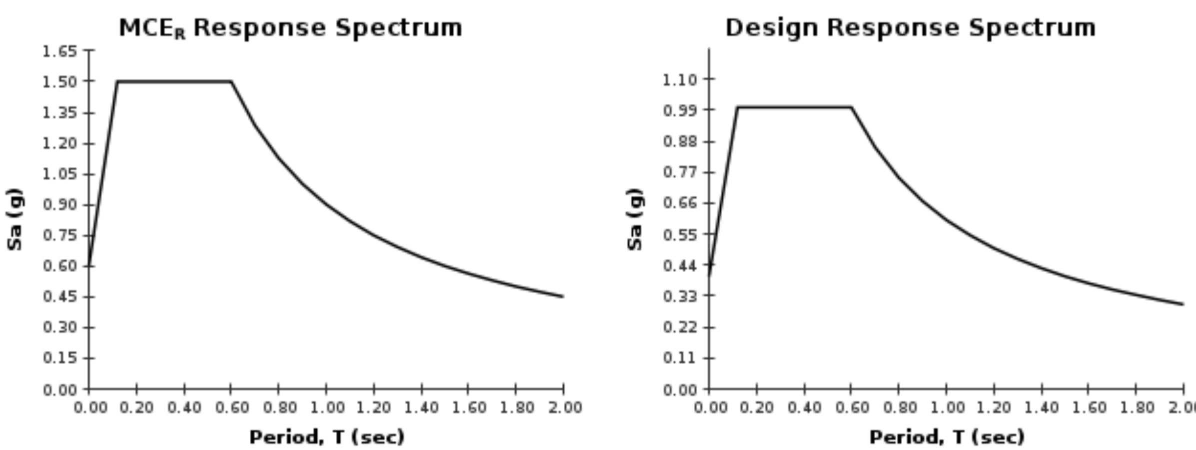

Figure 7: Earthquake design spectrum for site

6.0 ENGINEERING ANALYSES AND RECOMMENDATIONS

6.1 Earthwork

6.1.1 Analysis

Earthwork for this site appears to be quite simple. There are no dewatering issues because the water table is deep enough to not influence the foundation of this project. The site has a very level grade so it appears that there will be minimal soil removal needed. The Department of Transportation for the State of California Standard Specifications requirements will be met if the following recommendations in reference to earthwork for this site are incorporated.

6.1.2 Recommendations

The asphalt concrete currently on the site will need to be removed according to section 19-1.03B Unsuitable Material. The grade over the entire site should not exceed 0.05 foot above or below the grade established by the engineer according to section 19-1.03 C Grade Tolerance. The "backfill should be with materials of equal or better quality and to a comparable density of surrounding materials and grade surface to match the existing grade and cross slope". The relative compaction should be at least 95% of standard proctor as a normal value. The Standard Specifications Report should be reviewed with further questions (Caltrans, 2010).

6.2 Retaining Wall

6.2.1 Static and Seismically-induced Earth Pressures

Depending on the methods of construction, there may arise a need for retaining walls to be place on the edge of excavation to hold back the existing soil layers. Due to this possibility, a recommendation is made as to which type of retaining wall would fit the site conditions. The calculations were done using what was considered the "worst case" scenario concerning depth of excavation. This was done in order to safely cover all lesser depths that could be utilized during construction.

The passive, active and at-rest conditions were all taken into account during the analysis. Using the Rankine method for both the passive and active conditions, the pressure acting on the wall was found. Table 3 shows a comparison of the pressure on the wall at different conditions.

Upon review of the soil profile, the bearing pressures on the retaining wall were converted to equivalent fluid pressures. This method was chosen in order to get a more accurate analysis as to what would be required should the need arise for a retaining wall. Table3 below shows the equivalent fluid pressures of the existing soil profile and their accompanying K-values used in the calculations (Navy Facilities Engineering Command, 1982).

Table 3: Equivalent Fluid Pressures of Soil and Their Accompanying K-Values

Soil Type	Friction Angle ()	Depth (ft)	K_o-value	k_a-value	K_p-value	Dry Unit Weight (pcf)	Effective Fluid Weight (pcf)
Asphalt/Aggregate	50	1	0.233956	0.132474	7.548632	150	19.87
Silty Sand	33.5	2	0.448063	0.438092	3.463658	120	52.57
Poorly Graded Sand	29	1	0.51519	0.307259	2.88206	100	30.73
Silty Sand	32	9	0.470081	0.390462	3.254588	94	36.70
		Average:	0.416822	0.317072	4.287235	116	34.97

Retaining Wall Pressures for Different Cases		
Active Pressure	936.88	lb/ft of Wall
Passive Pressure	1199.32	lb/ft of Wall
At-Rest Pressure	1231.62	lb/ft of Wall

6.2.2 Drainage Requirements

Because of the relatively "high" groundwater table, there shall be installed at the base of the retaining wall a French drain to remove water from the base of the pile. This French drain shall be constructed using a 6" diameter pipe covered with 1" loosely graded rocks. If possible, an impermeable layer of material should be placed lining the canal of the French drain.

6.2.2 Recommendation

After the equivalent fluid pressure on the wall was found, the required section modulus was determined for the soldier pile to be used. The recommended pile to be used if necessary is an HP 10X42 pile. These piles should be placed 8ft on center and spanned by at minimum 4 rough sawn lumber. Soldier pile and lagging retaining wall should provide the most cost effective solution to possible cave-ins of the soil layer. Figure 8 below shows a cross-section of the recommended retaining wall.

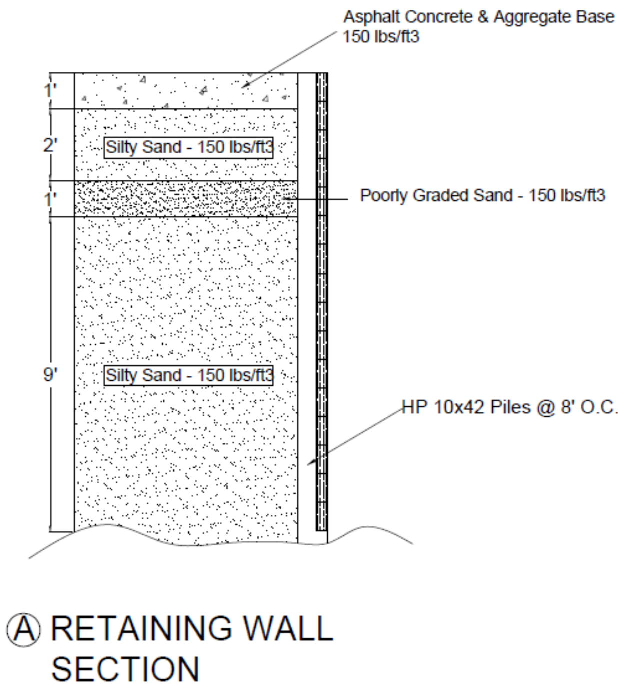

Figure 8: Cross-section view of retaining wall recommendation

6.3 Foundation

There are many different options for the foundation of a building. The most common way to separate the many options is shallow foundations and deep foundations. Shallow foundations work well when there is a light load to be supported and the underlying soil has a high load bearing capacity. On the other hand, deep foundations are used when the underlying soils are not strong enough and a deeper layer of soil with a higher bearing capacity must be used. Since the borings show at least forty feet of soft clay layers, the settlement of those layers would be an issue. Settlement of approximately 3 feet was calculated in the forty feet of clay layers between fifteen feet of depth to forty-five feet of depth under a building load of 100,000 kips by using the consolidation equations seen in Figure 9 (Das &Sobhan, 2010).

$$S_c = \frac{C_c H}{1 + e_o} \log\left(\frac{\sigma'_o + \Delta\sigma'}{\sigma'_o}\right)$$

$$S_c = \frac{C_s H}{1 + e_o} \log\left(\frac{\sigma'_o + \Delta\sigma'}{\sigma'_o}\right)$$

If $\sigma'_O + \Delta\sigma' > \sigma'_c$, then

$$S_c = \frac{C_s H}{1 + e_o} \log \frac{\sigma'_c}{\sigma'_o} + \frac{C_c H}{1 + e_o} \log\left(\frac{\sigma'_o + \Delta\sigma'}{\sigma'_c}\right)$$

Figure 9: Settlement equations

In order to not have too much settlement, a deep foundation was decided upon. Due to noise ordinances in the city, drilled shafts appear to be a better solution than driven piles. As such, shafts with diameters ranging from 2 feet to 8 feet and depths ranging from 15 feet to 80 feet were investigated. It was determined that 154, 2 foot diameter piles 75 feet in length would be best to support a 100,000 kip building load. A 4-foot diameter bell was included in the calculations. A visual representation of this recommendation is provided below in Figure 11.

Input Paramaters			
Factor of Safety (FS)	2.5		*Usually Between 2 to 3.
Minimum Diameter	24	inches	
Load to be supported by Shafts	100000	kips	
Allowable Settlement	1	inch	
Minimum Depth of Shaft	15	feet	*Min is 6
Maximum Depth of Shaft	75	feet	*Max is 75

Figure 10: Input parameters for drilled shaft calculator

Output Drilled Shaft Design

Diameter (in)	Depth (ft)	# Piles	Capacity (kips)	Settlement (in)	Cost $
24	75.00	154	100199	0.26	$14,514,158.06

The design includes a bell at the base of the shaft with a diameter of 48 inches.

Figure 10: Output design of drilled shafts for building

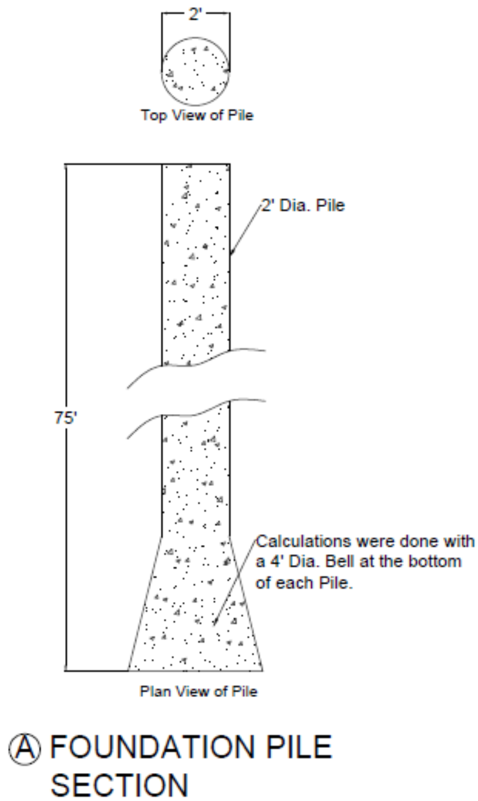

Figure 11: Foundation Pile Recommendation

6.3.1 Axial Pile Capacity

Side resistance for the drilled shaft in cohesionless layers was calculated using the Beta method. For the cohesive layers, the alpha-method was used as seen in Figures 12 and 13.

$$R_{SN} = \pi B \Delta z f_{SN} = \pi B \Delta z (\alpha s_u)_i \quad \text{13-15}$$

where:

R_{SN} = nominal side resistance,
B = shaft diameter,
Δz = thickness of the soil layer over which resistance is calculated,
s_u = average undrained shear strength over the depth interval Δz,
α = coefficient relating unit side resistance to undrained shear strength (hence the term "alpha method"), and
f_{SN} = nominal unit side resistance.

Figure 12: Alpha Method Side Resistance

$\alpha = 0$ between the ground surface and a depth of 5 ft or to the depth of seasonal moisture change, whichever is greater

$\alpha = 0.55$ along remaining portions of the shaft for $\frac{s_u}{p_a} \leq 1.5$

$\alpha = 0.55 - 0.1\left(\frac{s_u}{p_a} - 1.5\right)$ along remaining portions of the shaft for $1.5 \leq \frac{s_u}{p_a} \leq 2.5$

p_a = atmospheric pressure in the same units as s_u (2,116 psf or 14.7 psi in U.S. customary units).

Figure 13: Alpha Values

Skin resistance was neglected over a distance of one diameter above the top of the bell at the base of the shaft as suggested (AASHTO, 2007).

6.3.2 Estimates of Settlement

Settlement of the pile group was calculated to be 0.26 inches. It was calculated using equation 14-10 of the *Drilled Shafts Construction Procedures and LRFD Design Methods* (2010) manual for CPT q_c values in cohesionless saturated soils as seen in Figure 14 (FHWA-NHI, 2010).

For CPT q_c values in cohesionless saturated soils:

$$S_{group} = \frac{p_f \cdot I_f \cdot B}{2 \cdot \overline{q_c}} \quad \text{14-10}$$

where:

S_{group} = estimated total settlement (inches);
p_f = foundation pressure (ksf), group load divided by group area (plan view);
B = width of drilled shaft group (ft.);
D = drilled shaft embedment depth below grade (ft.);
I_f = influence factor for group embedment = 1 – [D/(8B)] ≥ 0.5;
$\overline{N'_{60}}$ = average corrected SPT N-value (bpf) within a depth B below the shaft tip;
$\overline{q_c}$ = average static cone tip resistance (ksf) within a depth B below the shaft tip.

Figure 14: Pile Group Settlement Equation

6.3.3 Lateral Pile Analysis Parameters

The lateral forces analysis was performed using L-Pile (2013). The subsurface profile can be seen in Figure 15. Soil properties were taken from CPT-1.

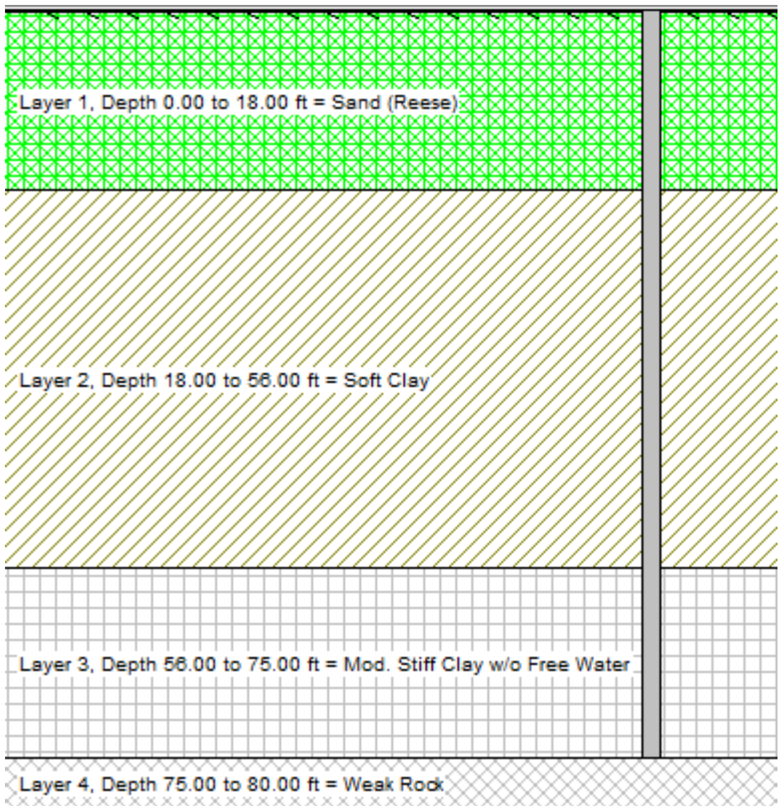

Figure 15: Subsurface Profile

Lateral shear forces of 1, 5, 10, 15, 20, 25, and 50 kips were applied to the shaft. An axial load of 650 kips was placed on the shaft as well. The results of the lateral pile analysis can be seen in Figure 16.

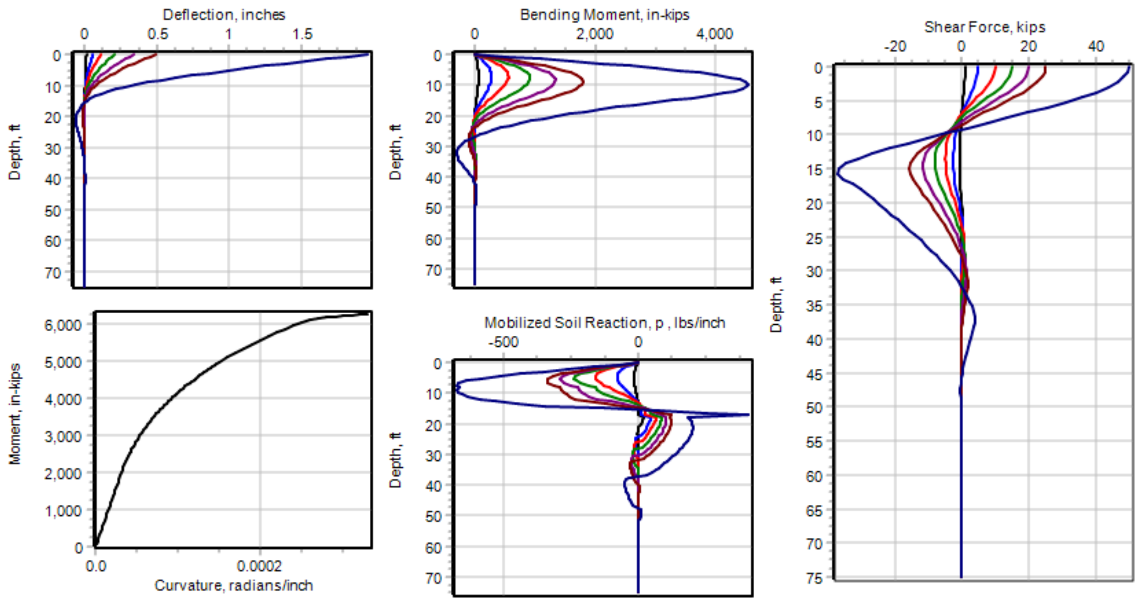

Figure 16: L-Pile Analysis

6.3.4 Recommendation

In order to support the building with minimal settlement, (154) 2' piles at a depth of 75 feet are recommended. The approximate cost will be $14.5 million and will have a settlement of .26 inches.

7.0 REFERENCES

AASHTO. (2007). *AASHTO LRFD Bridge Design Specifications* (4th Edition ed.). Washington DC: American Association of State Highway and Transportation Officials.

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California Emergency Management Agency. (2015). *MyHazards*. Retrieved January 16, 2015

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Das, B., & Sobhan, K. (2010). *Principles of Geotechnical Engineering* (8th Edition ed.). Boston: Cengage Learning.

FHWA-NHI. (2010). *Drilled Shafts: Construction Procedures and LRFD Design Methods.* US Federal Highway Administration. New York: US Department of Transportation.

Navy Facilities Engineering Command. (1982). *Foundations and Earth Structures.* Department of the Navy. Alexandria: Navy Facilities Engineering Command.

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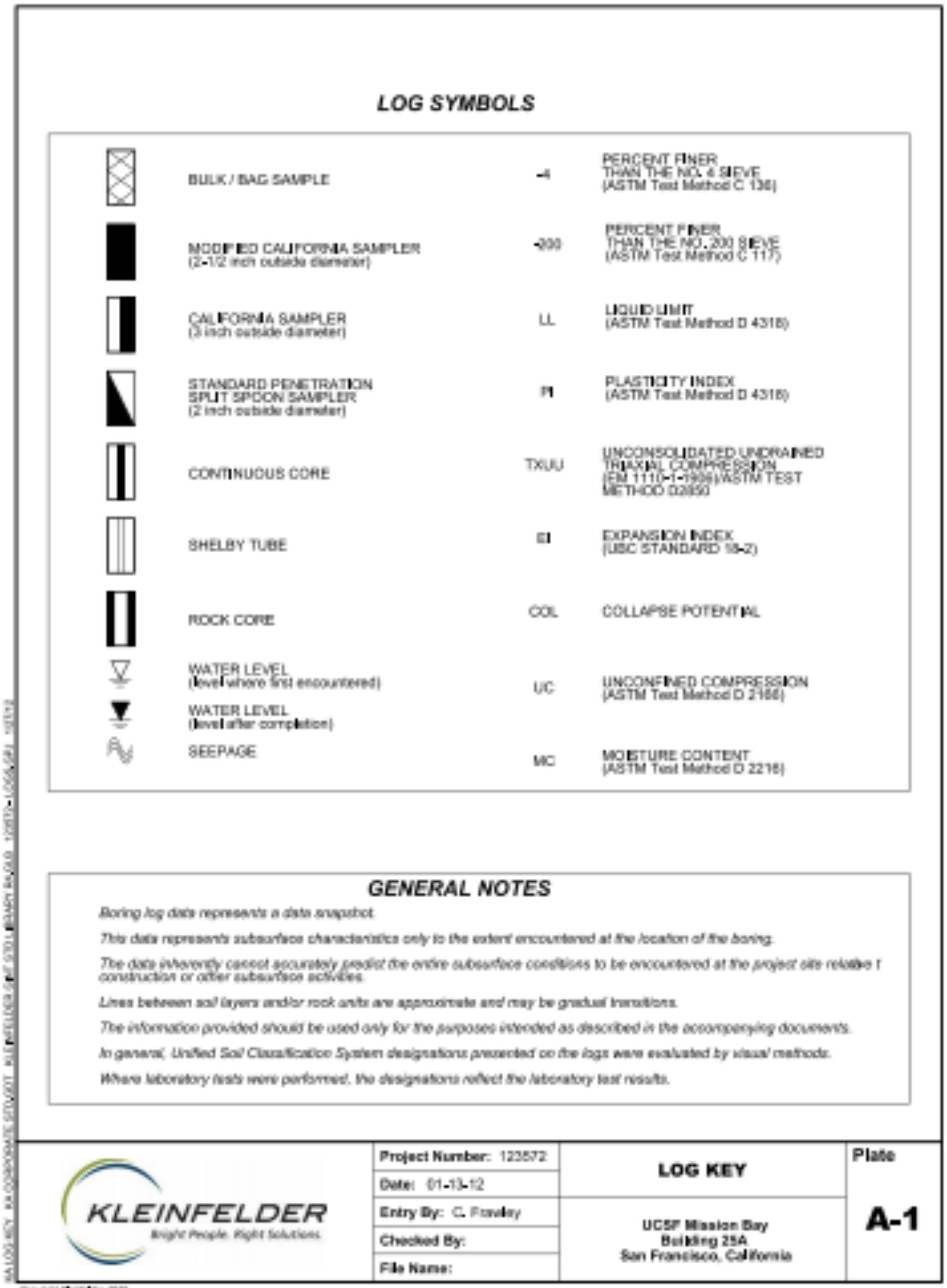
APPENDIX A: Laboratory Testing

Boring Log Raw Data



LOG SYMBOLS

BULK / BAG SAMPLE		-4	PERCENT FINER THAN THE NO. 4 SIEVE (ASTM Test Method C 136)
MODIFIED CALIFORNIA SAMPLER (2-1/2 inch outside diameter)		-200	PERCENT FINER THAN THE NO. 200 SIEVE (ASTM Test Method C 117)
CALIFORNIA SAMPLER (3 inch outside diameter)		LL	LIQUID LIMIT (ASTM Test Method D 4318)
STANDARD PENETRATION SPLIT SPOON SAMPLER (2 inch outside diameter)		PI	PLASTICITY INDEX (ASTM Test Method D 4318)
CONTINUOUS CORE		TXUU	UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION (EM 1110-1-1906)/ASTM TEST METHOD D2850
SHELBY TUBE		EI	EXPANSION INDEX (UBC STANDARD 18-2)
ROCK CORE		COL	COLLAPSE POTENTIAL
WATER LEVEL (level where first encountered)		UC	UNCONFINED COMPRESSION (ASTM Test Method D 2166)
WATER LEVEL (level after completion)			
SEEPAGE		MC	MOISTURE CONTENT (ASTM Test Method D 2216)

GENERAL NOTES

Boring log data represents a data snapshot.

This data represents subsurface characteristics only to the extent encountered at the location of the boring.

The data inherently cannot accurately predict the entire subsurface conditions to be encountered at the project site relative to construction or other subsurface activities.

Lines between soil layers and/or rock units are approximate and may be gradual transitions.

The information provided should be used only for the purposes intended as described in the accompanying documents.

In general, Unified Soil Classification System designations presented on the logs were evaluated by visual methods.

Where laboratory tests were performed, the designations reflect the laboratory test results.

KLEINFELDER *Bright People. Right Solutions.*	Project Number: 123572	LOG KEY	Plate
	Date: 01-13-12		A-1
	Entry By: C. Frawley	UCSF Mission Bay Building 25A San Francisco, California	
	Checked By:		
	File Name:		

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM 2487)

MAJOR DIVISIONS				*GRAPHIC LOG*	*TYPICAL DESCRIPTIONS*
COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	GRAVELS (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVELS WITH <5% FINES	$Cu \geq 4$ and $1 \leq Cc \leq 3$	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			$Cu < 4$ and/or $1 > Cc > 3$	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5 to 12% FINES	$Cu \geq 4$ and $1 \leq Cc \leq 3$	GW-GM	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			$Cu < 4$ and/or $1 > Cc > 3$	GP-GM	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GP-GC	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH >12% FINES		GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
				GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	$Cu \geq 6$ and $1 \leq Cc \leq 3$	SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			$Cu < 6$ and/or $1 > Cc > 3$	SP	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5 to 12% FINES	$Cu \geq 6$ and $1 \leq Cc \leq 3$	SW-SM	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			$Cu < 6$ and/or $1 > Cc > 3$	SP-SM	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SP-SC	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH >12% FINES		SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
				SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES
FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid limit less than 50)			ML	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY.
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid limit greater than 50)			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

KLEINFELDER
Bright People. Right Solutions.

Project Number: 123572	**UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D2487)**	Plate
Date: 01-13-12		**A-2**
Entry By: C. Frawley	**UCSF Mission Bay Building 25A San Francisco, California**	
Checked By:		
File Name:		

SYMBOL	ROCK TYPE	SYMBOL	ROCK TYPE	SYMBOL	ROCK TYPE
	BRECCIA		SILTSTONE		PHYLLITE
	CLAYSTONE		MUDSTONE		SANDSTONE
	CONGLOMERATE		SHALE		GREENSTONE
	GRANITE		BEDROCK		VOLCANIC

WEATHERING

Designation	Criteria
Decomposed	Rock reduced to soil with relict rock texture/structure; Generally molded and crumbled by hand.
Highly Weathered	Entire mass discolored; Alteration pervading nearly all rock with some slightly weathered pockets noticeable; Some minerals may be leached away.
Moderately Weathered	Discoloring evident; Surface pitted and alteration penetrating well below surface; Weathering "halos" evident; 10-50% of rock altered.
Slightly Weathered	Slight discoloration on surface; Slight alteration along discontinuities; <10% of rock volume altered.
Unweathered	No evidence of chemical/mechanical alteration.

FRACTURE SPACING

Designation	Criteria
Intensely Fractured	Spacing <2 inches
Highly Fractured	Spacing 2 inches to 8 inches
Moderately Fractured	Spacing 8 inches to 2 feet.
Slightly Fractured	Spacing 2 feet to 6 feet.
Unfractured	Spacing greater than 6 feet.

HARDNESS/STRENGTH

Designation	Criteria
Decomposed	Can be readily indented, grooved, or gouged with fingernail or carved with knife; Breaks with moderate to light manual pressure.
Soft	Can be grooved/gouged easily by knife or sharp pick with light pressure; Can be scratched by fingernail; Breaks under moderate manual pressure.
Moderately Soft	Can be grooved/gouged 2mm deep by knife or sharp pick with moderate to heavy pressure; Breaks with light hammer blow or heavy manual pressure.
Moderately Hard	Can be scratched with a knife or sharp pick with light to moderate pressure; Breaks with moderate hammer blow.
Hard	Can be scratched with a knife or sharp pick with difficulty (heavy pressure); Breaks with heavy hammer blow.
Very Hard	Cannot be scratched with a knife or sharp pick; Breaks with repeated hammer blows.
Extremely Hard	Cannot be scratched with a knife or sharp pick; Can only be chipped with repeated heavy hammer blows.

KLEINFELDER Bright People. Right Solutions.	Project Number: 123572	ROCK DESCRIPTION CRITERIA	Plate
	Date: 01-13-12		A-3
	Entry By: C. Frawley	UCSF Mission Bay Building 25A San Francisco, California	
	Checked By:		
	File Name:		

Boring Number: KB-1	**Location:** Northeast Parking Lot	**Drilling Method:** Mud Rotary
Boring Total Depth: 65.5 ft	**Coordinates (X/Y, Lat/Long):** ft / ft	**Drilling Equipment:** Failing 1500
Depth to Rock: 57.5 ft	**Datum/Coordinate System:** Mission Bay Datum	**Drilling Company:** Pitcher
Date Begin/End: 12-08-11 / 12-08-11	**Top of Boring Elevation:** 104.5 ft	**Bit Size/Type:** 4 7/8" / Drag Bit
Surface Conditions: Asphalt Concrete	**Coordinate Data Source:** -	**Hammer Type/Method:** Auto Trip / hydraulic
Groundwater Meas. Pt. Ground Surface	**Depth to Groundwater Initial/Time:** 15.0 ft / 0 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: C. Frawley	**Depth to Groundwater Final/Time:** 12.7 ft / 24 hrs after	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
						ASPHALT CONCRETE–approximately 4 inches thick									Garbage barrel used from 0 to 15 feet.
					SC	**AGGREGATE BASE**–approximately 3 inches thick	D								
		1	25 25 25			**Clayey SAND** (SC): brown, moist, fine sand and medium sand, (FILL)					10	119			
						-some fine gravel					4	106			
		2	5 7 11		SP	**Poorly Graded SAND** (SP): olive-yellow, moist, fine sand, (FILL)	MD								
5	99.5														
		3	50/3"			-large pieces of asphalt in sample and cuttings									
		4	9 10 14		SC	**Clayey SAND** (SC): gray, moist, fine sand to coarse sand, (FILL)	MD				9	131	85	17	
10	94.5					Brown									
		5	4 7 7		GC	**Clayey GRAVEL With Sand** (GC): brown, wet, fine sand to coarse sand, fine subangular to subrounded gravel (FILL)	L								
15	89.5												56	22	Begin rotary wash
															Installed casing down to 15 feet
					CH	**Elastic SILT (MH) To Fat Clay** (CH): dark gray, wet, (BAY MUD)	S	HP							
20	84.5	6	W O H	0.5					34	68	57	67			Su = 0.70 ksf (TORVANE)

KLEINFELDER
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Project Number: 123872	**BORING LOG KB-1**	**Plate** 1 of 3
Date: 01-13-12		
Entry By: C. Frawley	UCSF Mission Bay Building 25A San Francisco, California	**A-4**
Checked By:		
File Name:		

Boring Number: KB-1	Location: Northeast Parking Lot	Drilling Method: Mud Rotary
Boring Total Depth: 65.5 ft	Coordinates (X/Y, Lat/Long): ft / ft	Drilling Equipment: Failing 1500
Depth to Rock: 57.5 ft	Datum/Coordinate System: Mission Bay Datum	Drilling Company: Pitcher
Date Begin/End: 12-08-11 / 12-09-11	Top of Boring Elevation: 104.5 ft	Bit Size/Type: 4 7/8" / Drag Bit
Surface Conditions: Asphalt Concrete	Coordinate Data Source: -	Hammer Type/Method: Auto Trip / hydraulic
Groundwater Meas. Pt. Ground Surface	Depth to Groundwater Initial/Time: 15.0 ft / 0 hrs after	Hammer Drop/Weight: 30 in. / 140 lbs.
Logged By: C. Frawley	Depth to Groundwater Final/Time: 12.7 ft / 24 hrs after	Angle From Horizontal/Bearing: -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
			7	W O H	0.25		CH	**Elastic SILT (MH) To Fat Clay** (CH): continued	VS	HP							Su = 0.20 ksf (TORVANE)
								(BAY MUD) with shell frangments					56	67			
30	74.5		8	W O H	0.25								48	74			Su = 0.70 ksf (TORVANE)
					0.25												CONSOL
			9	50 psi					5	HP	53	87	74	56			Su = 0.83 ksf (TXUU)
35	69.5		10	W O H				Sand lense									
					0.75												
			11	W O H				Abundant organics									
40	64.5																
													73	56			
45	59.5		12	W O H	0.75				S	HP	39	73	60	64			Su = 0.89 ksf (TXUU)
							SC	**Silty SAND** (SC): olive-yellow, moist, fine sand, (ALLUVIUM)	VD								

KLEINFELDER Bright People. Right Solutions.	Project Number: 123872	BORING LOG KB-1	Plate 2 of 3
	Date: 01-13-12	UCSF Mission Bay Building 25A San Francisco, California	A-4
	Entry By: C. Frawley		
	Checked By:		
	File Name:		

Boring Number: KB-2	**Location:** Northwest Parking Lot	**Drilling Method:** Mud Rotary
Boring Total Depth: 60.1 ft	**Coordinates (X/Y, Lat/Long):** ft / ft	**Drilling Equipment:** Failing 1500
Depth to Rock: 53.0 ft	**Datum/Coordinate System:** Mission Bay Datum	**Drilling Company:** Pitcher
Date Begin/End: 12-07-11 / 12-08-11	**Top of Boring Elevation:** 103.5 ft	**Bit Size/Type:** 4 7/8" / Drag Bit
Surface Conditions: Asphalt Concrete	**Coordinate Data Source:** -	**Hammer Type/Method:** Auto Trip / hydraulic
Groundwater Meas. Pt. Ground Surface	**Depth to Groundwater Initial/Time:** 13.0 ft / 0 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: C. Frawley	**Depth to Groundwater Final/Time:** 11.0 ft / 24 hrs after	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
						ASPHALT CONCRETE approximately 4 inches thick									Garbage barrel from 0 to 15 feet
					SC	**AGGREGATE BASE** approximately 3 inches thick	MD								
		1	6 12 21			**Clayey SAND** (SC): mottled brown, reddish brown and yellow, moist, fine sand to medium sand, some fine gravel, (FILL)					10	108			
		2	3 6 18			Grades more fines and some trace coarse sand									
5	98.5					Brick in cuttings					8	120			
		3	5 13 15			Brown to olive-yellow, fine sand to coarse sand									
					SP-SM	**Poorly Graded SAND With Silt** (SP-SM): brown to olive-yellow, moist, fine sand to coarse sand, (FILL)	MD				4	118	63	10	
		4	7 11 13		SP	**Poorly Graded SAND** (SP): olive, moist, fine sand to medium sand, (FILL)	MD								
10	93.5										5	108	99	2	
						Dark brown, wood in cuttings, increase in moisture									
		5	3 6 6		SP-SM	**Poorly Graded SAND With Silt** (SP-SM): black, moist, fine sand, (FILL)	L								
15	88.5												93	9	Began rotary wash method, installed casing down to 15' feet
		6	W O H		CH	**Fat CLAY With Sand** (CH): black, moist, fine sand, (BAY MUD)	F	HP							
20	83.5			0.5		Some shells	S		31	65	48	73	95	80	Su = 0.70 ksf (TXUU)
		T	60 psi 100 psi												

KLEINFELDER Bright People. Right Solutions.	**Project Number:** 123872	**BORING LOG KB-2**	**Plate** 1 of 3
	Date: 01-13-12	UCSF Mission Bay Building 25A San Francisco, California	**A-5**
	Entry By: C. Frawley		
	Checked By:		
	File Name:		

Boring Number: KB-2	**Location:** Northwest Parking Lot	**Drilling Method:** Mud Rotary
Boring Total Depth: 60.1 ft	**Coordinates (X/Y, Lat/Long):** ft / ft	**Drilling Equipment:** Failing 1500
Depth to Rock: 53.0 ft	**Datum/Coordinate System:** Mission Bay Datum	**Drilling Company:** Pitcher
Date Begin/End: 12-07-11 / 12-08-11	**Top of Boring Elevation:** 103.5 ft	**Bit Size/Type:** 4 7/8" / Drag Bit
Surface Conditions: Asphalt Concrete	**Coordinate Data Source:** -	**Hammer Type/Method:** Auto Trip / hydraulic
Groundwater Meas. Pt. Ground Surface	**Depth to Groundwater Initial/Time:** 13.0 ft / 0 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: C. Frawley	**Depth to Groundwater Final/Time:** 11.0 ft / 24 hrs after	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
						ASPHALT CONCRETE approximately 4 inches thick									Garbage barrel from 0 to 15 feet
					SC	**AGGREGATE BASE** approximately 3 inches thick	MD								
		1	6 12 21			**Clayey SAND** (SC): mottled brown, reddish brown and yellow, moist, fine sand to medium sand, some fine gravel (FILL)					10	108			
		2	3 6 18			Grades more fines and some trace coarse sand									
5	98.5					Brick in cuttings					6	120			
		3	5 13 15			Brown to olive-yellow, fine sand to coarse sand									
					SP-SM	**Poorly Graded SAND With Silt** (SP-SM): brown to olive-yellow, moist, fine sand to coarse sand, (FILL)	MD				4	118	63	10	
		4	7 11 13		SP	**Poorly Graded SAND** (SP): olive, moist, fine sand to medium sand, (FILL)	MD								
10	93.5										5	108	99	2	
						Dark brown, wood in cuttings, increase in moisture									
		5	3 6 6		SP-SM	**Poorly Graded SAND With Silt** (SP-SM): black, moist, fine sand, (FILL)	L								
15	88.5												93	9	Began rotary wash method, installed casing down to 15' feet
		6	W O H		CH	**Fat CLAY With Sand** (CH): black, moist, fine sand, (BAY MUD)	F	HP							
20	83.5			0.5		Some shells	S		31	65	48	73	95	80	Su = 0.70 ksf (TXUU)
		T	50 psi 100 psi												

KLEINFELDER Bright People. Right Solutions.	**Project Number:** 123872 **Date:** 01-13-12 **Entry By:** C. Frawley **Checked By:** **File Name:**	**BORING LOG KB-2** UCSF Mission Bay Building 25A San Francisco, California	**Plate** 1 of 3 **A-5**

Boring Number: KB-2	**Location:** Northwest Parking Lot	**Drilling Method:** Mud Rotary
Boring Total Depth: 60.1 ft	**Coordinates (X/Y, Lat/Long):** ft / ft	**Drilling Equipment:** Failing 1500
Depth to Rock: 53.0 ft	**Datum/Coordinate System:** Mission Bay Datum	**Drilling Company:** Pitcher
Date Begin/End: 12-07-11 / 12-08-11	**Top of Boring Elevation:** 103.5 ft	**Bit Size/Type:** 4 7/8" / Drag Bit
Surface Conditions: Asphalt Concrete	**Coordinate Data Source:** -	**Hammer Type/Method:** Auto Trip / hydraulic
Groundwater Meas. Pt. Ground Surface	**Depth to Groundwater Initial/Time:** 13.0 ft / 0 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: C. Frawley	**Depth to Groundwater Final/Time:** 11.0 ft / 24 hrs after	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
			8	W O H	1.0		CH	**Fat CLAY With Sand** (CH): gray, continued (BAY MUD)					80	72			
30	73.5		9	W O H	1.0						71	118	84	51			Su = 0.[?] ksf (TXUU)
35	68.5		10	0 0 1	1.0			Abundant organics									
40	63.5		11	W O H	0.5			Wet					77	54			
			12	50 psi 125 psi	0.25		MH	**To Elastic SILT** (MH)	VS	MP	40	76	63	62			Su = 0.[?]5 ksf (TXUU)
45	58.5		13	0 3 26	0.5				S								
							SM	**Silty SAND** (SM): gray, wet, fine sand. (ALLUVIUM)	D				20	110	100	17	

KLEINFELDER Bright People. Right Solutions.	**Project Number:** 123872	**BORING LOG KB-2**	**Plate** 2 of 3
	Date: 01-13-12		**A-5**
	Entry By: C. Frawley	**UCSF Mission Bay Building 25A San Francisco, California**	
	Checked By:		
	File Name:		

Boring Number: KB-2	**Location:** Northwest Parking Lot	**Drilling Method:** Mud Rotary
Boring Total Depth: 60.1 ft	**Coordinates (X/Y, Lat/Long):** ft / ft	**Drilling Equipment:** Failing 1500
Depth to Rock: 53.0 ft	**Datum/Coordinate System:** Mission Bay Datum	**Drilling Company:** Pitcher
Date Begin/End: 12-07-11 / 12-08-11	**Top of Boring Elevation:** 103.5 ft	**Bit Size/Type:** 4 7/8" / Drag Bit
Surface Conditions: Asphalt Concrete	**Coordinate Data Source:** -	**Hammer Type/Method:** Auto Trip / hydraulic
Groundwater Meas. Pt. Ground Surface	**Depth to Groundwater Initial/Time:** 13.0 ft / 0 hrs after	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: C. Frawley	**Depth to Groundwater Final/Time:** 11.0 ft / 24 hrs after	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
			14	10 13 16			SC	**Clayey SAND** (SC): gray, moist, fine sand Olive-yellow, fine sand to medium sand	MD						100	30	
								SHALE: olive brown, moderately weathered, weak to moderately strong (BEDROCK)									
55	48.5		15	60/2"													
60	43.5		16	60/2"				Boring terminated at a depth of approximately 60.2 feet. Groundwater encountered 11 feet during drilling. Boring backfilled with cement grout.									
65	38.5																
70	33.5																

KLEINFELDER *Bright People. Right Solutions.*	**Project Number:** 123872 **Date:** 01-13-12 **Entry By:** C. Frawley **Checked By:** **File Name:**	**BORING LOG KB-2** UCSF Mission Bay Building 25A San Francisco, California	**Plate** 3 of 3 **A-5**

Boring Number: KB-3	**Location:** Southeast Parking Lot	**Drilling Method:** Mud Rotary
Boring Total Depth: 45.3 ft	**Coordinates (X/Y, Lat/Long):** ft / ft	**Drilling Equipment:** Failing 1500
Depth to Rock: 37.0 ft	**Datum/Coordinate System:** Mission Bay Datum	**Drilling Company:** Pitcher
Date Begin/End: 12-09-12 / 12-09-12	**Top of Boring Elevation:** 105.0 ft	**Bit Size/Type:** 4 7/8" / Drag Bit
Surface Conditions: Asphalt Concrete	**Coordinate Data Source:** -	**Hammer Type/Method:** Auto Trip / hydraulic
Groundwater Meas. Pt.	**Depth to Groundwater Initial/Time:**	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: C. Frawley	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to these stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
								ASPHALT CONCRETE approximately 3.5 inches thick									Garbage barrel from 0 to 13.5 feet
							SM	**AGGREGATE BASE** approximately 3 inches thick	D								
			1	14 23 24				**Silty SAND** (SM): yellow-brown and olive, moist, fine sand and medium sand, some coarse sand, trace fine gravel (NEWER FILL)					11	120			
			2	18 22 19			SP	**Poorly Graded SAND** (SP): olive, moist, fine sand, (FILL)	MD								
5	100.0						SM	**Silty SAND** (SM): brown, moist, fine sand to coarse sand, brick (FILL)	MD								
			3	3 4 1					L								
								Abundant brick fragments and wood							89	26	
			4	1 3 10													
10	95.0							Encountered specimen with strong hydrocarbon odor					18	94	94	15	
			5	W O H			CH	**Fat CLAY** (CH): gray, moist, some shells (BAY MUD)	F	HP			55	69			Began rotary wash method
15	90.0																
20	85.0																

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Project Number: 123872	**BORING LOG KB-3**	**Plate** 1 of 2
Date: 11-13-12	**UCSF Mission Bay Building 25A San Francisco, California**	**A-6**
Entry By: C. Frawley		
Checked By:		
File Name:		

Boring Number: KB-3	**Location:** Southeast Parking Lot	**Drilling Method:** Mud Rotary
Boring Total Depth: 45.3 ft	**Coordinates (X/Y, Lat/Long):** ft / ft	**Drilling Equipment:** Failing 1500
Depth to Rock: 37.0 ft 38.5'	**Datum/Coordinate System:** Mission Bay Datum	**Drilling Company:** Pitcher
Date Begin/End: 12-09-12 / 12-09-12	**Top of Boring Elevation:** 105.0 ft	**Bit Size/Type:** 4 7/8" / Drag Bit
Surface Conditions: Asphalt Concrete	**Coordinate Data Source:** -	**Hammer Type/Method:** Auto Trip / hydraulic
Groundwater Meas. Pt.	**Depth to Groundwater Initial/Time:**	**Hammer Drop/Weight:** 30 in. / 140 lbs.
Logged By: C. Frawley	**Depth to Groundwater Final/Time:**	**Angle From Horizontal/Bearing:** -90°

The report and log key are an integral part of these logs. All data and interpretations in this log are subject to those stated explanations and limitations.

Depth (ft)	Elevation (ft)	Sample Type Symbol	Sample Number	Blows per 6 in.	Pocket Pen. (tsf)	Graphic Log	ASTM Symbol	Field Soil Description & Classification: Description	Consistency / Apparent Density	Plasticity	Laboratory: Plasticity Index	Liquid Limit	Water Content (%)	Dry Unit Weight (pcf)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests and Field Notes
							CH	**FatCLAY** (CH): continued									Installed casing to 25 feet
30	75.0		6	50 psi 100 psi	0.25		CL	**SandyLEAN CLAY** (CL): gray, wet, fine sand	VS	LP	9	24	20	110			CONSOL Su = 0.24 ksf (TXUU)
35	70.0		7	6 12 18	2.5		CL	**SandyLEAN CLAY** (CL): olive brown, wet Fine sand to coarse sand, with coarse gravel up to 1 inch diameter	F	MP					89	70	
40	65.0		8	70/3"				**SERPENTINITE AND SHALE** greenish gray and reddish brown, moderately weathered, moderately strong to strong (BEDROCK)									
45	60.0		9	88/3"				Boring terminated at a depth of approximately 45.3 feet. Groundwater was not measures during drilling. Boring backfilled with cement grout.									

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Project Number: 123872	**BORING LOG KB-3**	**Plate** 2 of 2
Date: 01-13-12		
Entry By: C. Frawley	**UCSF Mission Bay** **Building 25A** **San Francisco, California**	**A-6**
Checked By:		
File Name:		

Raw CPT Data

	Input Data				Interpretation results										
No.	Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	qt (tsf)	Rf (%)	Gamma (	FC (%)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Ic SBT	SBT	Ic	SBTn
1	0.16404	-9999	-9999	-9999	0	0	120.9	N/A	0.00992	0	0.00992	0	0	N/A	0
2	0.32808	-9999	-9999	-9999	0	0	120.9	N/A	0.01983	0	0.01983	0	0	N/A	0
3	0.49213	-9999	-9999	-9999	0	0	120.9	N/A	0.02975	0	0.02975	0	0	N/A	0
4	0.65617	-9999	-9999	-9999	0	0	120.9	N/A	0.03967	0	0.03967	0	0	N/A	0
5	0.82021	-9999	-9999	-9999	0	0	120.9	N/A	0.04958	0	0.04958	0	0	N/A	0
6	0.98425	-9999	-9999	-9999	0	0	120.9	N/A	0.0595	0	0.0595	0	0	N/A	0
7	1.14829	-9999	-9999	-9999	0	0	120.9	N/A	0.06941	0	0.06941	0	0	N/A	0
8	1.31234	-9999	-9999	-9999	0	0	120.9	N/A	0.07933	0	0.07933	0	0	N/A	0
9	1.47638	-9999	-9999	-9999	0	0	120.9	N/A	0.08925	0	0.08925	0	0	N/A	0
10	1.64042	-9999	-9999	-9999	0	0	120.9	N/A	0.09916	0	0.09916	0	0	N/A	0
11	1.80446	-9999	-9999	-9999	0	0	120.9	N/A	0.10908	0	0.10908	0	0	N/A	0
12	1.9685	-9999	-9999	-9999	0	0	120.9	N/A	0.119	0	0.119	0	0	N/A	0
13	2.13255	-9999	-9999	-9999	0	0	120.9	N/A	0.12891	0	0.12891	0	0	N/A	0
14	2.29659	-9999	-9999	-9999	0	0	120.9	N/A	0.13883	0	0.13883	0	0	N/A	0
15	2.46063	-9999	-9999	-9999	0	0	120.9	N/A	0.14875	0	0.14875	0	0	N/A	0
16	2.62467	-9999	-9999	-9999	0	0	120.9	N/A	0.15866	0	0.15866	0	0	N/A	0
17	2.78871	-9999	-9999	-9999	0	0	120.9	N/A	0.16858	0	0.16858	0	0	N/A	0
18	2.95276	-9999	-9999	-9999	0	0	120.9	N/A	0.17849	0	0.17849	0	0	N/A	0
19	3.1168	-9999	-9999	-9999	0	0	120.9	N/A	0.18841	0	0.18841	0	0	N/A	0
20	3.28084	-9999	-9999	-9999	0	0	120.9	N/A	0.19833	0	0.19833	0	0	N/A	0
21	3.44488	-9999	-9999	-9999	0	0	120.9	N/A	0.20824	0	0.20824	0	0	N/A	0
22	3.60892	-9999	-9999	-9999	0	0	120.9	N/A	0.21816	0	0.21816	0	0	N/A	0
23	3.77297	-9999	-9999	-9999	0	0	120.9	N/A	0.22808	0	0.22808	0	0	N/A	0
24	3.93701	-9999	-9999	-9999	0	0	120.9	N/A	0.23799	0	0.23799	0	0	N/A	0
25	4.10105	-9999	-9999	-9999	0	0	120.9	N/A	0.24791	0	0.24791	0	0	N/A	0
26	4.26509	-9999	-9999	-9999	0	0	120.9	N/A	0.25782	0	0.25782	0	0	N/A	0
27	4.42913	-9999	-9999	-9999	0	0	120.9	N/A	0.26774	0	0.26774	0	0	N/A	0
28	4.59318	-9999	-9999	-9999	0	0	120.9	N/A	0.27766	0	0.27766	0	0	N/A	0
29	4.75722	-9999	-9999	-9999	0	0	120.9	N/A	0.28757	0	0.28757	0	0	N/A	0

	Input Data				Interpretation results										
No.	Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	qt (tsf)	Rf (%)	Gamma (	FC (%)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Ic SBT	SBT	Ic	SBTn
1	0.16404	-9999	-9999	-9999	0	0	120.9	N/A	0.00992	0	0.00992	0	0	N/A	0
2	0.32808	-9999	-9999	-9999	0	0	120.9	N/A	0.01983	0	0.01983	0	0	N/A	0
3	0.49213	-9999	-9999	-9999	0	0	120.9	N/A	0.02975	0	0.02975	0	0	N/A	0
4	0.65617	-9999	-9999	-9999	0	0	120.9	N/A	0.03967	0	0.03967	0	0	N/A	0
5	0.82021	-9999	-9999	-9999	0	0	120.9	N/A	0.04958	0	0.04958	0	0	N/A	0
6	0.98425	-9999	-9999	-9999	0	0	120.9	N/A	0.0595	0	0.0595	0	0	N/A	0
7	1.14829	-9999	-9999	-9999	0	0	120.9	N/A	0.06941	0	0.06941	0	0	N/A	0
8	1.31234	-9999	-9999	-9999	0	0	120.9	N/A	0.07933	0	0.07933	0	0	N/A	0
9	1.47638	-9999	-9999	-9999	0	0	120.9	N/A	0.08925	0	0.08925	0	0	N/A	0
10	1.64042	-9999	-9999	-9999	0	0	120.9	N/A	0.09916	0	0.09916	0	0	N/A	0
11	1.80446	-9999	-9999	-9999	0	0	120.9	N/A	0.10908	0	0.10908	0	0	N/A	0
12	1.9685	-9999	-9999	-9999	0	0	120.9	N/A	0.119	0	0.119	0	0	N/A	0
13	2.13255	-9999	-9999	-9999	0	0	120.9	N/A	0.12891	0	0.12891	0	0	N/A	0
14	2.29659	-9999	-9999	-9999	0	0	120.9	N/A	0.13883	0	0.13883	0	0	N/A	0
15	2.46063	-9999	-9999	-9999	0	0	120.9	N/A	0.14875	0	0.14875	0	0	N/A	0
16	2.62467	-9999	-9999	-9999	0	0	120.9	N/A	0.15866	0	0.15866	0	0	N/A	0
17	2.78871	-9999	-9999	-9999	0	0	120.9	N/A	0.16858	0	0.16858	0	0	N/A	0
18	2.95276	-9999	-9999	-9999	0	0	120.9	N/A	0.17849	0	0.17849	0	0	N/A	0
19	3.1168	-9999	-9999	-9999	0	0	120.9	N/A	0.18841	0	0.18841	0	0	N/A	0
20	3.28084	-9999	-9999	-9999	0	0	120.9	N/A	0.19833	0	0.19833	0	0	N/A	0
21	3.44488	-9999	-9999	-9999	0	0	120.9	N/A	0.20824	0	0.20824	0	0	N/A	0
22	3.60892	-9999	-9999	-9999	0	0	120.9	N/A	0.21816	0	0.21816	0	0	N/A	0
23	3.77297	-9999	-9999	-9999	0	0	120.9	N/A	0.22808	0	0.22808	0	0	N/A	0
24	3.93701	-9999	-9999	-9999	0	0	120.9	N/A	0.23799	0	0.23799	0	0	N/A	0
25	4.10105	-9999	-9999	-9999	0	0	120.9	N/A	0.24791	0	0.24791	0	0	N/A	0
26	4.26509	-9999	-9999	-9999	0	0	120.9	N/A	0.25782	0	0.25782	0	0	N/A	0
27	4.42913	-9999	-9999	-9999	0	0	120.9	N/A	0.26774	0	0.26774	0	0	N/A	0
28	4.59318	-9999	-9999	-9999	0	0	120.9	N/A	0.27766	0	0.27766	0	0	N/A	0
29	4.75722	-9999	-9999	-9999	0	0	120.9	N/A	0.28757	0	0.28757	0	0	N/A	0

	Input Data				Interpretation results										
No.	Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	qt (tsf)	Rf (%)	Gamma (	FC (%)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Ic SBT	SBT	Ic	SBTn
1	0.16404	-9999	-9999	-9999	0	0	120.9	N/A	0.00992	0	0.00992	0	0	N/A	0
2	0.32808	-9999	-9999	-9999	0	0	120.9	N/A	0.01983	0	0.01983	0	0	N/A	0
3	0.49213	-9999	-9999	-9999	0	0	120.9	N/A	0.02975	0	0.02975	0	0	N/A	0
4	0.65617	-9999	-9999	-9999	0	0	120.9	N/A	0.03967	0	0.03967	0	0	N/A	0
5	0.82021	-9999	-9999	-9999	0	0	120.9	N/A	0.04958	0	0.04958	0	0	N/A	0
6	0.98425	-9999	-9999	-9999	0	0	120.9	N/A	0.0595	0	0.0595	0	0	N/A	0
7	1.14829	-9999	-9999	-9999	0	0	120.9	N/A	0.06941	0	0.06941	0	0	N/A	0
8	1.31234	-9999	-9999	-9999	0	0	120.9	N/A	0.07933	0	0.07933	0	0	N/A	0
9	1.47638	-9999	-9999	-9999	0	0	120.9	N/A	0.08925	0	0.08925	0	0	N/A	0
10	1.64042	-9999	-9999	-9999	0	0	120.9	N/A	0.09916	0	0.09916	0	0	N/A	0
11	1.80446	-9999	-9999	-9999	0	0	120.9	N/A	0.10908	0	0.10908	0	0	N/A	0
12	1.9685	-9999	-9999	-9999	0	0	120.9	N/A	0.119	0	0.119	0	0	N/A	0
13	2.13255	-9999	-9999	-9999	0	0	120.9	N/A	0.12891	0	0.12891	0	0	N/A	0
14	2.29659	-9999	-9999	-9999	0	0	120.9	N/A	0.13883	0	0.13883	0	0	N/A	0
15	2.46063	-9999	-9999	-9999	0	0	120.9	N/A	0.14875	0	0.14875	0	0	N/A	0
16	2.62467	-9999	-9999	-9999	0	0	120.9	N/A	0.15866	0	0.15866	0	0	N/A	0
17	2.78871	-9999	-9999	-9999	0	0	120.9	N/A	0.16858	0	0.16858	0	0	N/A	0
18	2.95276	-9999	-9999	-9999	0	0	120.9	N/A	0.17849	0	0.17849	0	0	N/A	0
19	3.1168	-9999	-9999	-9999	0	0	120.9	N/A	0.18841	0	0.18841	0	0	N/A	0
20	3.28084	-9999	-9999	-9999	0	0	120.9	N/A	0.19833	0	0.19833	0	0	N/A	0
21	3.44488	-9999	-9999	-9999	0	0	120.9	N/A	0.20824	0	0.20824	0	0	N/A	0
22	3.60892	-9999	-9999	-9999	0	0	120.9	N/A	0.21816	0	0.21816	0	0	N/A	0
23	3.77297	-9999	-9999	-9999	0	0	120.9	N/A	0.22808	0	0.22808	0	0	N/A	0
24	3.93701	-9999	-9999	-9999	0	0	120.9	N/A	0.23799	0	0.23799	0	0	N/A	0
25	4.10105	-9999	-9999	-9999	0	0	120.9	N/A	0.24791	0	0.24791	0	0	N/A	0
26	4.26509	-9999	-9999	-9999	0	0	120.9	N/A	0.25782	0	0.25782	0	0	N/A	0
27	4.42913	-9999	-9999	-9999	0	0	120.9	N/A	0.26774	0	0.26774	0	0	N/A	0
28	4.59318	-9999	-9999	-9999	0	0	120.9	N/A	0.27766	0	0.27766	0	0	N/A	0
29	4.75722	-9999	-9999	-9999	0	0	120.9	N/A	0.28757	0	0.28757	0	0	N/A	0

	Input Data				Interpretation results										
No.	Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	qt (tsf)	Rf (%)	Gamma (	FC (%)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Ic SBT	SBT	Ic	SBTn
1	0.16404	-9999	-9999	-9999	0	0	120.9	N/A	0.00992	0	0.00992	0	0	N/A	0
2	0.32808	-9999	-9999	-9999	0	0	120.9	N/A	0.01983	0	0.01983	0	0	N/A	0
3	0.49213	-9999	-9999	-9999	0	0	120.9	N/A	0.02975	0	0.02975	0	0	N/A	0
4	0.65617	-9999	-9999	-9999	0	0	120.9	N/A	0.03967	0	0.03967	0	0	N/A	0
5	0.82021	-9999	-9999	-9999	0	0	120.9	N/A	0.04958	0	0.04958	0	0	N/A	0
6	0.98425	-9999	-9999	-9999	0	0	120.9	N/A	0.0595	0	0.0595	0	0	N/A	0
7	1.14829	-9999	-9999	-9999	0	0	120.9	N/A	0.06941	0	0.06941	0	0	N/A	0
8	1.31234	-9999	-9999	-9999	0	0	120.9	N/A	0.07933	0	0.07933	0	0	N/A	0
9	1.47638	-9999	-9999	-9999	0	0	120.9	N/A	0.08925	0	0.08925	0	0	N/A	0
10	1.64042	-9999	-9999	-9999	0	0	120.9	N/A	0.09916	0	0.09916	0	0	N/A	0
11	1.80446	-9999	-9999	-9999	0	0	120.9	N/A	0.10908	0	0.10908	0	0	N/A	0
12	1.9685	-9999	-9999	-9999	0	0	120.9	N/A	0.119	0	0.119	0	0	N/A	0
13	2.13255	-9999	-9999	-9999	0	0	120.9	N/A	0.12891	0	0.12891	0	0	N/A	0
14	2.29659	-9999	-9999	-9999	0	0	120.9	N/A	0.13883	0	0.13883	0	0	N/A	0
15	2.46063	-9999	-9999	-9999	0	0	120.9	N/A	0.14875	0	0.14875	0	0	N/A	0
16	2.62467	-9999	-9999	-9999	0	0	120.9	N/A	0.15866	0	0.15866	0	0	N/A	0
17	2.78871	-9999	-9999	-9999	0	0	120.9	N/A	0.16858	0	0.16858	0	0	N/A	0
18	2.95276	-9999	-9999	-9999	0	0	120.9	N/A	0.17849	0	0.17849	0	0	N/A	0
19	3.1168	-9999	-9999	-9999	0	0	120.9	N/A	0.18841	0	0.18841	0	0	N/A	0
20	3.28084	-9999	-9999	-9999	0	0	120.9	N/A	0.19833	0	0.19833	0	0	N/A	0
21	3.44488	-9999	-9999	-9999	0	0	120.9	N/A	0.20824	0	0.20824	0	0	N/A	0
22	3.60892	-9999	-9999	-9999	0	0	120.9	N/A	0.21816	0	0.21816	0	0	N/A	0
23	3.77297	-9999	-9999	-9999	0	0	120.9	N/A	0.22808	0	0.22808	0	0	N/A	0
24	3.93701	-9999	-9999	-9999	0	0	120.9	N/A	0.23799	0	0.23799	0	0	N/A	0
25	4.10105	-9999	-9999	-9999	0	0	120.9	N/A	0.24791	0	0.24791	0	0	N/A	0
26	4.26509	-9999	-9999	-9999	0	0	120.9	N/A	0.25782	0	0.25782	0	0	N/A	0
27	4.42913	-9999	-9999	-9999	0	0	120.9	N/A	0.26774	0	0.26774	0	0	N/A	0
28	4.59318	-9999	-9999	-9999	0	0	120.9	N/A	0.27766	0	0.27766	0	0	N/A	0
29	4.75722	-9999	-9999	-9999	0	0	120.9	N/A	0.28757	0	0.28757	0	0	N/A	0

	Input Data				Interpretation results										
No.	Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	qt (tsf)	Rf (%)	Gamma (	FC (%)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Ic SBT	SBT	Ic	SBTn
1	0.16404	-9999	-9999	-9999	0	0	120.9	N/A	0.00992	0	0.00992	0	0	N/A	0
2	0.32808	-9999	-9999	-9999	0	0	120.9	N/A	0.01983	0	0.01983	0	0	N/A	0
3	0.49213	-9999	-9999	-9999	0	0	120.9	N/A	0.02975	0	0.02975	0	0	N/A	0
4	0.65617	-9999	-9999	-9999	0	0	120.9	N/A	0.03967	0	0.03967	0	0	N/A	0
5	0.82021	-9999	-9999	-9999	0	0	120.9	N/A	0.04958	0	0.04958	0	0	N/A	0
6	0.98425	-9999	-9999	-9999	0	0	120.9	N/A	0.0595	0	0.0595	0	0	N/A	0
7	1.14829	-9999	-9999	-9999	0	0	120.9	N/A	0.06941	0	0.06941	0	0	N/A	0
8	1.31234	-9999	-9999	-9999	0	0	120.9	N/A	0.07933	0	0.07933	0	0	N/A	0
9	1.47638	-9999	-9999	-9999	0	0	120.9	N/A	0.08925	0	0.08925	0	0	N/A	0
10	1.64042	-9999	-9999	-9999	0	0	120.9	N/A	0.09916	0	0.09916	0	0	N/A	0
11	1.80446	-9999	-9999	-9999	0	0	120.9	N/A	0.10908	0	0.10908	0	0	N/A	0
12	1.9685	-9999	-9999	-9999	0	0	120.9	N/A	0.119	0	0.119	0	0	N/A	0
13	2.13255	-9999	-9999	-9999	0	0	120.9	N/A	0.12891	0	0.12891	0	0	N/A	0
14	2.29659	-9999	-9999	-9999	0	0	120.9	N/A	0.13883	0	0.13883	0	0	N/A	0
15	2.46063	-9999	-9999	-9999	0	0	120.9	N/A	0.14875	0	0.14875	0	0	N/A	0
16	2.62467	-9999	-9999	-9999	0	0	120.9	N/A	0.15866	0	0.15866	0	0	N/A	0
17	2.78871	-9999	-9999	-9999	0	0	120.9	N/A	0.16858	0	0.16858	0	0	N/A	0
18	2.95276	-9999	-9999	-9999	0	0	120.9	N/A	0.17849	0	0.17849	0	0	N/A	0
19	3.1168	-9999	-9999	-9999	0	0	120.9	N/A	0.18841	0	0.18841	0	0	N/A	0
20	3.28084	-9999	-9999	-9999	0	0	120.9	N/A	0.19833	0	0.19833	0	0	N/A	0
21	3.44488	-9999	-9999	-9999	0	0	120.9	N/A	0.20824	0	0.20824	0	0	N/A	0
22	3.60892	-9999	-9999	-9999	0	0	120.9	N/A	0.21816	0	0.21816	0	0	N/A	0
23	3.77297	-9999	-9999	-9999	0	0	120.9	N/A	0.22808	0	0.22808	0	0	N/A	0
24	3.93701	-9999	-9999	-9999	0	0	120.9	N/A	0.23799	0	0.23799	0	0	N/A	0
25	4.10105	-9999	-9999	-9999	0	0	120.9	N/A	0.24791	0	0.24791	0	0	N/A	0
26	4.26509	-9999	-9999	-9999	0	0	120.9	N/A	0.25782	0	0.25782	0	0	N/A	0
27	4.42913	-9999	-9999	-9999	0	0	120.9	N/A	0.26774	0	0.26774	0	0	N/A	0
28	4.59318	-9999	-9999	-9999	0	0	120.9	N/A	0.27766	0	0.27766	0	0	N/A	0
29	4.75722	-9999	-9999	-9999	0	0	120.9	N/A	0.28757	0	0.28757	0	0	N/A	0

	Input Data				Interpretation results										
No.	Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	qt (tsf)	Rf (%)	Gamma (	FC (%)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Ic SBT	SBT	Ic	SBTn
1	0.16404	-9999	-9999	-9999	0	0	120.9	N/A	0.00992	0	0.00992	0	0	N/A	0
2	0.32808	-9999	-9999	-9999	0	0	120.9	N/A	0.01983	0	0.01983	0	0	N/A	0
3	0.49213	-9999	-9999	-9999	0	0	120.9	N/A	0.02975	0	0.02975	0	0	N/A	0
4	0.65617	-9999	-9999	-9999	0	0	120.9	N/A	0.03967	0	0.03967	0	0	N/A	0
5	0.82021	-9999	-9999	-9999	0	0	120.9	N/A	0.04958	0	0.04958	0	0	N/A	0
6	0.98425	-9999	-9999	-9999	0	0	120.9	N/A	0.0595	0	0.0595	0	0	N/A	0
7	1.14829	-9999	-9999	-9999	0	0	120.9	N/A	0.06941	0	0.06941	0	0	N/A	0
8	1.31234	-9999	-9999	-9999	0	0	120.9	N/A	0.07933	0	0.07933	0	0	N/A	0
9	1.47638	-9999	-9999	-9999	0	0	120.9	N/A	0.08925	0	0.08925	0	0	N/A	0
10	1.64042	-9999	-9999	-9999	0	0	120.9	N/A	0.09916	0	0.09916	0	0	N/A	0
11	1.80446	-9999	-9999	-9999	0	0	120.9	N/A	0.10908	0	0.10908	0	0	N/A	0
12	1.9685	-9999	-9999	-9999	0	0	120.9	N/A	0.119	0	0.119	0	0	N/A	0
13	2.13255	-9999	-9999	-9999	0	0	120.9	N/A	0.12891	0	0.12891	0	0	N/A	0
14	2.29659	-9999	-9999	-9999	0	0	120.9	N/A	0.13883	0	0.13883	0	0	N/A	0
15	2.46063	-9999	-9999	-9999	0	0	120.9	N/A	0.14875	0	0.14875	0	0	N/A	0
16	2.62467	-9999	-9999	-9999	0	0	120.9	N/A	0.15866	0	0.15866	0	0	N/A	0
17	2.78871	-9999	-9999	-9999	0	0	120.9	N/A	0.16858	0	0.16858	0	0	N/A	0
18	2.95276	-9999	-9999	-9999	0	0	120.9	N/A	0.17849	0	0.17849	0	0	N/A	0
19	3.1168	-9999	-9999	-9999	0	0	120.9	N/A	0.18841	0	0.18841	0	0	N/A	0
20	3.28084	-9999	-9999	-9999	0	0	120.9	N/A	0.19833	0	0.19833	0	0	N/A	0
21	3.44488	-9999	-9999	-9999	0	0	120.9	N/A	0.20824	0	0.20824	0	0	N/A	0
22	3.60892	-9999	-9999	-9999	0	0	120.9	N/A	0.21816	0	0.21816	0	0	N/A	0
23	3.77297	-9999	-9999	-9999	0	0	120.9	N/A	0.22808	0	0.22808	0	0	N/A	0
24	3.93701	-9999	-9999	-9999	0	0	120.9	N/A	0.23799	0	0.23799	0	0	N/A	0
25	4.10105	-9999	-9999	-9999	0	0	120.9	N/A	0.24791	0	0.24791	0	0	N/A	0
26	4.26509	-9999	-9999	-9999	0	0	120.9	N/A	0.25782	0	0.25782	0	0	N/A	0
27	4.42913	-9999	-9999	-9999	0	0	120.9	N/A	0.26774	0	0.26774	0	0	N/A	0
28	4.59318	-9999	-9999	-9999	0	0	120.9	N/A	0.27766	0	0.27766	0	0	N/A	0
29	4.75722	-9999	-9999	-9999	0	0	120.9	N/A	0.28757	0	0.28757	0	0	N/A	0

	Input Data				Interpretation results										
No.	Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	qt (tsf)	Rf (%)	Gamma (	FC (%)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Ic SBT	SBT	Ic	SBTn
1	0.16404	-9999	-9999	-9999	0	0	120.9	N/A	0.00992	0	0.00992	0	0	N/A	0
2	0.32808	-9999	-9999	-9999	0	0	120.9	N/A	0.01983	0	0.01983	0	0	N/A	0
3	0.49213	-9999	-9999	-9999	0	0	120.9	N/A	0.02975	0	0.02975	0	0	N/A	0
4	0.65617	-9999	-9999	-9999	0	0	120.9	N/A	0.03967	0	0.03967	0	0	N/A	0
5	0.82021	-9999	-9999	-9999	0	0	120.9	N/A	0.04958	0	0.04958	0	0	N/A	0
6	0.98425	-9999	-9999	-9999	0	0	120.9	N/A	0.0595	0	0.0595	0	0	N/A	0
7	1.14829	-9999	-9999	-9999	0	0	120.9	N/A	0.06941	0	0.06941	0	0	N/A	0
8	1.31234	-9999	-9999	-9999	0	0	120.9	N/A	0.07933	0	0.07933	0	0	N/A	0
9	1.47638	-9999	-9999	-9999	0	0	120.9	N/A	0.08925	0	0.08925	0	0	N/A	0
10	1.64042	-9999	-9999	-9999	0	0	120.9	N/A	0.09916	0	0.09916	0	0	N/A	0
11	1.80446	-9999	-9999	-9999	0	0	120.9	N/A	0.10908	0	0.10908	0	0	N/A	0
12	1.9685	-9999	-9999	-9999	0	0	120.9	N/A	0.119	0	0.119	0	0	N/A	0
13	2.13255	-9999	-9999	-9999	0	0	120.9	N/A	0.12891	0	0.12891	0	0	N/A	0
14	2.29659	-9999	-9999	-9999	0	0	120.9	N/A	0.13883	0	0.13883	0	0	N/A	0
15	2.46063	-9999	-9999	-9999	0	0	120.9	N/A	0.14875	0	0.14875	0	0	N/A	0
16	2.62467	-9999	-9999	-9999	0	0	120.9	N/A	0.15866	0	0.15866	0	0	N/A	0
17	2.78871	-9999	-9999	-9999	0	0	120.9	N/A	0.16858	0	0.16858	0	0	N/A	0
18	2.95276	-9999	-9999	-9999	0	0	120.9	N/A	0.17849	0	0.17849	0	0	N/A	0
19	3.1168	-9999	-9999	-9999	0	0	120.9	N/A	0.18841	0	0.18841	0	0	N/A	0
20	3.28084	-9999	-9999	-9999	0	0	120.9	N/A	0.19833	0	0.19833	0	0	N/A	0
21	3.44488	-9999	-9999	-9999	0	0	120.9	N/A	0.20824	0	0.20824	0	0	N/A	0
22	3.60892	-9999	-9999	-9999	0	0	120.9	N/A	0.21816	0	0.21816	0	0	N/A	0
23	3.77297	-9999	-9999	-9999	0	0	120.9	N/A	0.22808	0	0.22808	0	0	N/A	0
24	3.93701	-9999	-9999	-9999	0	0	120.9	N/A	0.23799	0	0.23799	0	0	N/A	0
25	4.10105	-9999	-9999	-9999	0	0	120.9	N/A	0.24791	0	0.24791	0	0	N/A	0
26	4.26509	-9999	-9999	-9999	0	0	120.9	N/A	0.25782	0	0.25782	0	0	N/A	0
27	4.42913	-9999	-9999	-9999	0	0	120.9	N/A	0.26774	0	0.26774	0	0	N/A	0
28	4.59318	-9999	-9999	-9999	0	0	120.9	N/A	0.27766	0	0.27766	0	0	N/A	0
29	4.75722	-9999	-9999	-9999	0	0	120.9	N/A	0.28757	0	0.28757	0	0	N/A	0

Cooper Testing Labs, Inc. (ASTM D 2937)

CTL Job No:	336-218a			Project No.	123572.3		By: BB	
Client:	Kleinfelder			Date:	12/23/11			
Project Name:	UCSF Mission Bay Bldg 25A			Remarks:				

Boring: / Sample: / Depth, ft:	KB-1 / 2	KB-1 / 4	KB-1 / 9	KB-1 / 21	KB-1 / 26	KB-1 / 30.5	KB-1 / 40.5	KB-2 / 2.0
Visual Description:	Olive Clayey SAND, trace Gravel	Olive Brown SAND w/ Silt	Very Dark Gray Silty SAND w/ Gravel	Black Elastic SILT	Dark Greenish Gray CLAY w/ Shell fragments (Bay Mud)	Bluish Gray CLAY w/ Shell fragments (Bay Mud)	Gray CLAY (Bay Mud)	Olive Brown Clayey SAND changing to Olive Silty SAND
Actual G_s								
Assumed G_s	2.70	2.70	2.70	2.75	2.70	2.70	2.70	2.70
Moisture, %	9.6	4.1	9.2	56.9	56.0	47.5	73.2	9.7
Wet Unit wt, pcf	130.4	110.2	130.7	104.5	104.1	108.7	96.1	118.1
Dry Unit wt, pcf	119.0	105.9	119.7	66.6	66.7	73.7	55.5	107.7
Dry Bulk Dens.ρb, (g/cc)	1.91	1.70	1.92	1.07	1.07	1.18	0.89	1.72
Saturation, %	61.8	18.6	60.9	99.1	98.9	99.5	96.9	46.0
Total Porosity, %	29.5	37.2	29.1	61.2	60.5	56.3	67.1	36.2
Volumetric Water Cont, Θw	18.2	6.9	17.7	60.7	59.8	56.1	65.0	16.6
Volumetric Air Cont., Θa	11.3	30.3	11.4	0.5	0.7	0.3	2.1	19.5
Void Ratio	0.42	0.59	0.41	1.58	1.53	1.29	2.04	0.57
Series	1	2	3	4	5	6	7	8

Note: All reported parameters are from the as-received sample condition unless otherwise noted. If an assumed specific gravity (Gs) was used then the saturation, porosities, and void ratio should be considered approximate.

The Zero Air-Voids curves represent the dry density at 100% saturation for each value of specific gravity

APPENDIX B: Soil Profiles

Northeast Parking Lot	
65.5 ft	Boring Total Depth
57.5 ft	Depth to Rock
15ft/0hrs	Depth to ground water initial/time
12.7ft/24 hr	Depth to ground water final/time

Depth (ft)	Blow counts per ft	Sample #	ASTM Symbol	Description	Plasticity	PI	LL	Water Content %	Dry Unit Weight (pcf)
2.5	50	1	SC	Clayey Sand				10	119
5	18	2	SP	Poorly Graded Sand				4	106
6.5	100	3	SP	Poorly Graded Sand					
10	24	4	SC	Clayey Sand				9	131
15	14	5	GC	Clayey Gravel with Sand					
21.5	1	6	CH	Elastic Silt to Fat Clay		34	68	57	67
26.5	1	7	CH	Elastic Silt to Fat Clay				56	67
31.5	1	8	CH	Elastic Silt to Fat Clay				48	74
35	50 psi	9	CH	Elastic Silt to Fat Clay	HP	53	97	74	56
36.5	1	10	CH	Elastic Silt to Fat Clay					
41	1	11	CH	Elastic Silt to Fat Clay					
46.5	1	12	CH	Elastic Silt to Fat Clay	HP	39	73	60	64
51.5	65	13	SC	Silty Sand					
56.5	16	14	CL	Sandy Lean Clay					
60.5	120	15		Serpentinite and shale					
65.5	140	16							

Depth (ft)	Description	Plasticity	PI	LL	Water Content (%)	Dry Unit Weight (pcf)
1	Asphalt Concrete (4 in.), Aggregate Base (3 in.)					
2	Clayey Sand				10	119
3	Clayey Sand				4	106
4	Poorly Graded Sand					
5	Poorly Graded Sand					
6	Poorly Graded Sand					
7	Poorly Graded Sand					

8						
9					9	131
10						
11	Clayey Sand					
12						Groundwater
13						
14						
15	Clayey Gravel with Sand					
16						
17						
18		HP				
19						
20						
21						
22			34	68	57	67
23						
24						
25		HP				
26						
27					56	67
28						
29						
30						
31					48	74
32	Elastic Silt to Fat Clay					
33						
34		HP	53	97	74	56
35						
36						
37						
38						
39						
40						
41						
42					73	56
43						
44						
45						
46		HP	39	73	60	64
47	Silty Sand					
48						

49		
50		
51		
52		
53		
54		
55	Sandy Lean Clay	
56		MP
57	Serpentine and Shale (Bedrock)	
58		
59		
60		
61		
62		
63		
64		
65		
66		

Northwest Parking Lot	
60.1ft	Boring Total Depth
53ft	Depth to Rock
13 ft/0 hr	Depth to ground water initial/time
11 ft/24 hr	Depth to ground water final/time

Depth (ft)	Blow counts per ft.	Sample #	ASTM Symbol	Description	Plasticity	PI	LL	Water Content %	Dry Unit Weight (pcf)
2.5	33	1	SC	Clayey Sand				10	108
5	24	2	SC	Clayey Sand				8	120
7.5	28	3	SP-SM	Poorly Graded Sand with Silt				4	118
10	24	4	SP	Poorly Graded Sand				5	108
15	12	5	SP-SM	Poorly Graded Sand with Silt					
20	1	6	CH	Fat Clay with Sand	HP	31	65	48	73
23	50psi, 100psi	7	CH	Fat Clay with Sand					
26.5	1	8	CH	Fat Clay with Sand				50	72
31.5	1	9	CH	Fat Clay with Sand					
36.5	0.5	10	CH	Fat Clay with Sand					
41.5	1	11	CH	Fat Clay with Sand				77	54
45	50psi, 125psi	12	MH	Elastic Silt	MP	40	76	63	62
46.5	29	13	SM	Elastic Silt				20	110

51.5	29	14	SC	Clayey Sand					
55	160	15		Shale					
60.1	160	16							

Depth (ft)	Description	Plasticity	PI	LL	Water Content (%)	Dry Unit Weight (pcf)
1	Asphalt Concrete (4 in.), Aggregate Base (3 in.)					
2						
3					10	108
4	Clayey Sand					
5					8	120
6						
7	Poorly Graded Sand with Silt				4	118
8						
9						
10	Poorly Graded Sand				5	108
11						Groundwater
12						
13						
14						
15	Poorly Graded Sand with Silt					
16						
17						
18						
19		HP				
20			31	65	48	73
21						
22						
23						
24						
25						
26	Fat Clay with Sand				50	72
27						
28						
29						
30						
31						
32			71	118	84	51
33						
34						

35						
36						
37						
38						
39						
40						
41						
42					77	54
43		MP	40	76	63	62
44						
45						
46						
47	Silty Sand				20	110
48						
49						
50						
51	Clayey Sand					
52						
53						
54						
55						
56						
57	Shale					
58						
59						
60						
61						

Southeast Parking Lot	
45.3	Boring Total Depth
37	Depth to Rock
	Depth to ground water initial/time
	Depth to ground water final/time

Depth (ft)	Blows per ft	Sample #	ASTM Symbol	Description	Plasticity	PI	LL	Water Content %	Dry Unit Weight (pcf)
2.5	47	1	SM	Silty Sand				11	120
5	41	2	SP	Poorly Graded Sand					
7.5	5	3	SM	Silty Sand					
10	19	4	SM	Silty Sand				18	94
15	1	5	CH	Fat Clay	HP			55	69

30	50psi, 100psi	6	CL	Sandy Lean Clay	LP	9	24	20	110
36.5	30	7	CL	Sandy Lean Clay	MP				
40.5	140	8		Serpentinite and Shale					
45.3	160	9							

Depth (ft)	Description	Plasticity	PI	LL	Water Content (%)	Dry Unit Weight (pcf)
1	Asphalt Concrete (3.5 in.), Aggregate Base (3 in.)					
2	Silty Sand				11	120
3						
4	Poorly Graded Sand					
5						
6						
7						
8						
9	Silty Sand					
10					18	94
11						
12						
13		HP			55	69
14						
15						
16						
17						
18						
19						
20	Fat Clay					
21						
22						
23						
24						
25						
26						
27						
28		LP	9	24	20	110
29						
30	Sandy Lean Clay					
31						
32						
33						

34		
35		MP
36		
37		
38		
39	Serpentinite and Shale	
40		
41		
42		
43		
44		
45		
46		